

**Reasons for and Impacts of
Changing Fed Cattle Procurement Practices**

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Forward contracts and marketing agreements between cattle feeders and beef packers, popularly referred to as “captive supply”, have become increasingly popular in the beef industry in recent years. Proponents of these marketing methods claim substantial benefits from their development. However, critics raise concerns that these evolving procurement methods have been detrimental to cattle producers claiming such practices adversely impact competition for fed cattle. The purpose of this report is to provide an assessment of the following issues: 1) What has motivated the beef industry to adopt these marketing methods; 2) What benefits accrue to producers and packers who utilize these marketing arrangements; and 3) Have captive supplies *caused* lower fed cattle prices? Answering these questions requires a synthesis of data and considerable published research. Critical to policy deliberations on cattle procurement methods is understanding the economics of the issues and the scientific base of knowledge.

Beef Industry Motivation for Changing Marketing Methods

Beef Demand Problems

To comprehend why the evolution in fed cattle markets is occurring, and what the impacts of this evolution are, requires an understanding of the economic conditions encouraging change. One of the most formidable challenges facing the beef industry has been the dramatic sustained decline in beef demand. The beef industry suffered a precipitous decline in demand over the past 20 years.¹ Figure 1 illustrates beef price-quantity relationships (i.e., points on various demand curves) from 1980 to 1999 (each point represents a point on a different demand curve during the year indicated). From 1980 to 1986 the amount of beef offered for consumption increased slightly more than 2 pounds per person. However, inflation-adjusted retail beef price (\$/lb.) had to decline 27% to encourage consumers to consume this additional 2 pounds. From 1980 to 1986 alone beef demand declined 24% (Schroeder, Marsh, and Mintert 2000).

From 1986 to 1993, beef supplies per person fell by 17%. Such a huge supply decline would result in considerably higher (i.e., about 25% higher based on typical estimated beef demand flexibilities²) retail prices in a market with stable demand. However, inflation-adjusted retail beef price increased only 1.5%, confirming that beef demand was still declining. From 1993 to 1998, beef demand continued to fall. Based on an estimated demand elasticity³ of -0.67 (Brester and Schroeder 1995; Eales and Unnevehr 1988; and Kinnucan et al. 1997), beef demand declined about 13% from 1993 to 1998. During 1999 the beef industry realized the first demand increase in over 20 years increasing by approximately 4% relative to 1998 (Schroeder, Marsh,

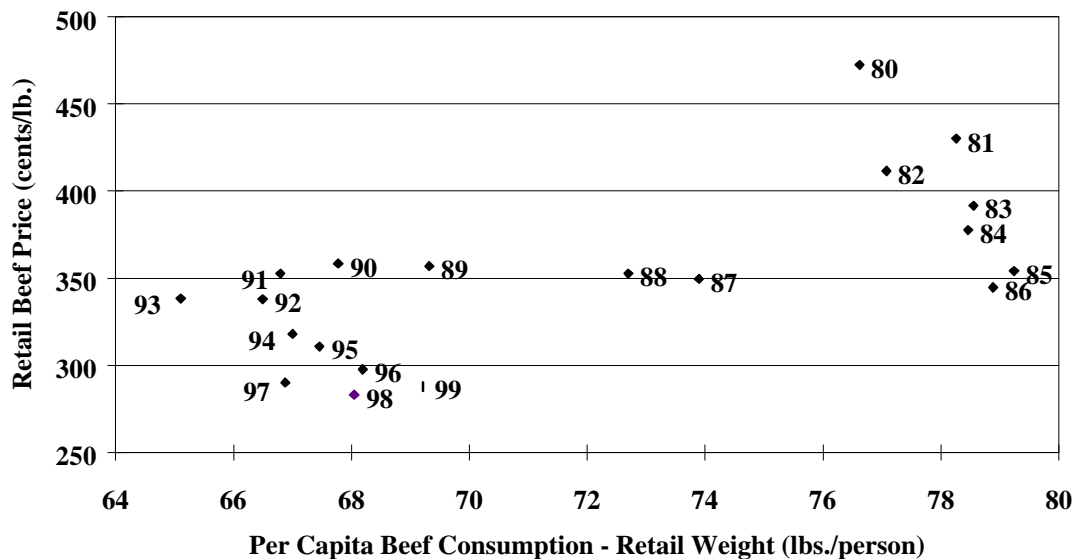
¹ A sizeable part of this demand trend discussion is taken from Schroeder and Mark (2000).

² Demand flexibilities are the percentage change in price for a one percent change in quantity demanded. A reasonable beef demand flexibility is approximately -1.5 (Dahlgran 1987; and Eales and Unnevehr 1993).

³ The elasticity of demand is the percentage change in quantity of beef consumed for a one percent change in retail beef price. Or, equivalently, elasticity is the slope of the demand curve in logarithmic space.

and Mintert 2000). Overall, from 1980 through 1997-98 (at its lowest point) beef demand declined nearly 50% (Figure 2).⁴

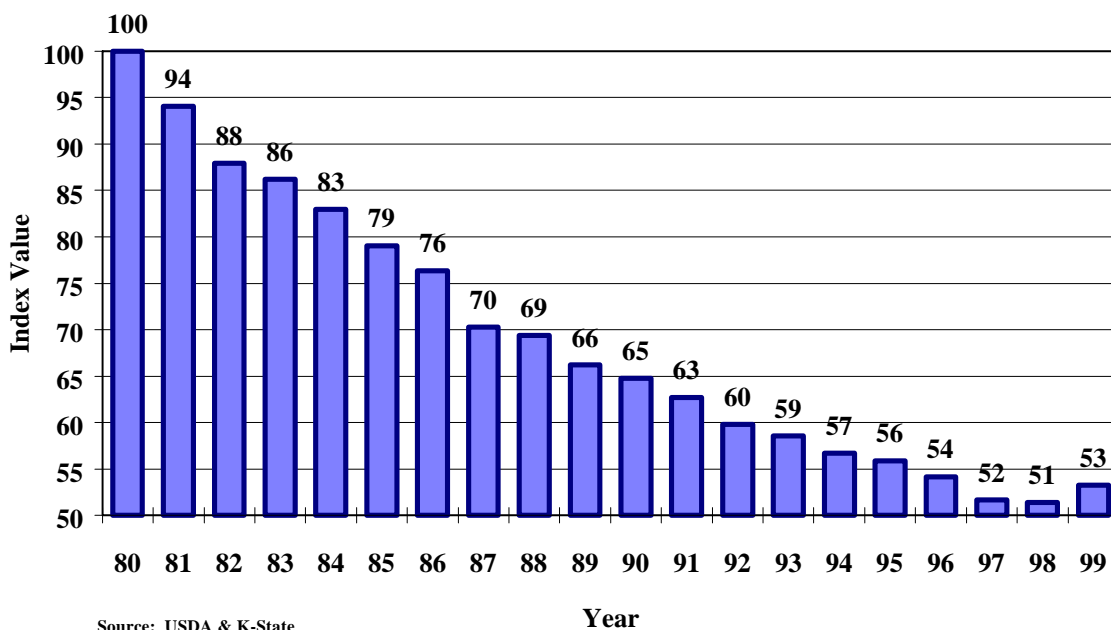
Figure 1. Annual Inflation-Adjusted Beef Price - Per Capita Quantity Relationships, 1980-1999.



Source: USDA & Commerce Dept.

Price Deflated by Consumer Price Index 1999=100

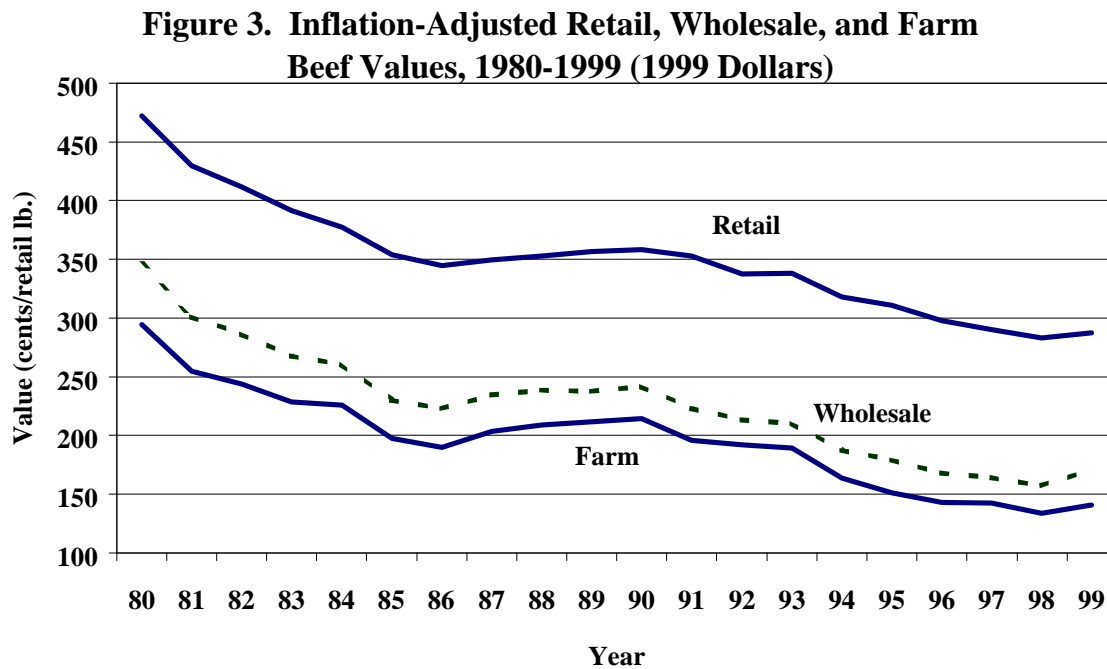
Figure 2. Retail Beef Demand Index, 1980=100



Source: USDA & K-State

⁴ The beef demand index is calculated assuming a demand elasticity of -0.67 and measuring how far vertically the demand curve shifted relative to 1980 inflation-adjusted price and quantity.

Demand for fed cattle by beef packers is derived from demand for beef at the retail level. Therefore, as retail beef demand declined from 1980 to 1998, fed cattle demand also declined. Similarly both retail and fed cattle demand increased in 1999 relative to 1998. As demand declines, everything else constant, price also declines. The substantial declines in beef demand resulted in lower retail and wholesale beef prices and thus lower slaughter cattle prices, as demonstrated in figure 3. It's important to understand that as retail beef demand declined, wholesale beef and live cattle demand also declined causing declines in both wholesale beef and slaughter cattle prices, all else constant.



Source: USDA & Commerce Dept.
Price Deflated by Consumer Price Index 1999=100

Why did beef demand decline so dramatically over such a long time period? The answer is multi-faceted as beef demand is influenced by many factors. However, the essence of a large body of research indicates the primary causes of the decline in beef demand were 1) poor and inconsistent beef quality, 2) changing consumer demographics and preferences, 3) health and nutrition concerns, 4) food safety concerns, and 5) lack of innovative product development (especially products that are convenient to prepare).⁵

⁵ See for example, Brester and Schroeder (1995); Capps and Schmitz (1991); Dahlgran (1987); Eales and Unnevehr (1993 and 1988); Flake and Patterson (1999); Kinnucan et al. (1997); Lamb and Beshear (1998); Purcell (1998a and 1998b); Schroeder and Mark (2000); and Schroeder, Marsh, and Mintert (2000).

What's the Solution?

Solving these problems takes a multitude of changes throughout the beef production and marketing system. Consumers want tender, flavorful, convenient to prepare, high quality, healthy and nutritious, safe, and competitively priced beef products. The traditional beef production and marketing system has failed to consistently supply the consumer every one of these basic product attributes. These facts have been well documented (see Purcell 1998a and 1998b; Schroeder, Marsh, and Mintert 2000; Smith et al. 1995).

Every beef industry participant including input suppliers, seedstock producers, cow-calf producers, feedlots, packers and processors, retail and food service firms influence and bear responsibility for failure to provide consumers the products they want. One of the reasons the beef industry failed to supply beef products that consumers wanted was because of a lack of vertical coordination in the production and marketing chain. Producers were not provided adequate pricing signals to produce the kinds of products consumers wanted. Pricing fed cattle on a live animal or dressed weight basis, where all cattle in a pen (or even worse, an entire showlist) receive the same price does not provide cattle producers with the necessary economic incentives to produce the kind of cattle beef packers and consumers desire.

Recent research demonstrates how poorly average live- and dressed-weight pricing of fed cattle is at sending appropriate value signals to producers (Schroeder and Graff, 2000). When fed cattle are sold via a live or dressed weight pricing system, high quality cattle receive prices that are on average \$30/head to \$40/head lower than their estimated "value" and lower quality cattle receive \$30/head to \$40/head more than their estimated "value". In other words, high-quality cattle subsidize low-quality cattle by \$30/head to \$40/head, on average. Further, more than half of the pens of cattle (71 pens) analyzed by Schroeder and Graff contained individual cattle that ranged in value by more than \$200/head when they were sold under a marketing agreement with prices paid to reflect meat value differences across carcasses. These were pens of cattle targeted and produced for a marketing agreement grid. Typical pens of cattle that were not targeted for marketing via a grid-based pricing system have value ranges exceeding \$200/head.

Some progressive cattle producers recognized the problems inherent in live and carcass weight pricing systems over a decade ago and they approached several beef packers to negotiate marketing agreements whereby fed cattle would be marketed under a new pricing system (see Schroeder et al. 1998). The new pricing system would reward feeders for producing high quality cattle and penalize them for producing low quality cattle. Since that time numerous cattle producers have realized potential benefits of establishing contracts or marketing agreements with packers to increase the price they receive for cattle and they have pursued development of such agreements. The price increase is a result of producers of higher than average quality cattle no longer subsidizing producers of lower quality cattle by selling all cattle on averages. Benefits accrue to both producers and packers as a result of such agreements.

Why Cattle Producers and Beef Packers Enter Into Forward Contracts and Marketing Agreements

Several motivations exist for cattle producers and beef packers to become involved in forward contracts and marketing agreements. This section of the manuscript summarizes research that has been completed examining incentives for cattle producers and beef packers to enter into forward contracts and marketing agreements.

Beef Packer Motivations

In a recent study Hayenga et al. (2000) surveyed 15 of the largest U.S. beef packers during April 2000. The purpose of the survey was to obtain information regarding beef packer cattle procurement and beef marketing practices, and perceptions of gains or losses from changes in vertical linkages with cattle producers. Ten of the 15 beef packing firms provided completed survey responses. The survey respondents collectively represented approximately 72 percent of 1999 cattle slaughter. Part of the study's findings are summarized here.

Cattle procurement practices are evolving from live cattle cash market purchases to more long term contractual and/or value based grid purchase, yet negotiated cash market pricing arrangements are dominant. Only 5 percent of cattle slaughtered by survey respondents were owned by the processing firm and fed in their own lots or by other cattle feeders. This percentage has changed little over the last 15 years. In 1999, survey respondents reported 36 percent of cattle were purchased on the cash market on a live weight basis, and 29 percent on a carcass weight or grid (carcass merit) basis (Table 1). Thus, approximately two-thirds of cattle slaughtered were cash market acquisitions.

Long term (more than 14 days) formula-priced contracts linked to cash market (live cattle or wholesale beef prices reported by USDA, plant cost averages, or retail beef prices) or futures market prices accounted for 20 percent of 1999 purchases. Four percent of cattle purchased were via short-term contract arrangements based on the Chicago Mercantile Exchange live cattle futures prices (basis contracts, or fixed price based on futures market prices, with deliveries typically several months in the future). Three percent of cattle were acquired under risk and profit-sharing marketing contract arrangements with cattle feeders (but were not owned by packers while in feedlots).

Grid or carcass merit pricing is clearly increasing in the fed cattle market. Cash market purchases by packer buyers are based on their expectations of likely carcass quality. However, there are still a large number of cattle feeders who sell their entire group of pens (perhaps with several owners in custom feedlots) at the same live or carcass price, allowing little distinction for quality on a lot-by-lot let alone carcass-by-carcass basis. Cash market purchases based on carcass merit are increasing in the cash and contract markets. In 1999, at least 35 percent of cattle purchased on contract or in the cash market were priced based on carcass merit (some packers did not break that out in their responses). Most cattle fed by packers were also transferred to their packing operations based on carcass merit.

Table 1. Percentage of Cattle Procured via Various Methods, 1999.

Purchase method	Percentage
Cash market purchases on live weight basis	36
Cash market purchases on a carcass-weight or grid basis	29
Formula-priced contract purchases based on a reported live cash market, Reported dressed price, plant average, CME cattle	
Futures price, quoted boxed beef or retail beef price	20
Packer-fed cattle	5
Fixed price or basis contract purchases based on CME futures	4
Risk-sharing contract purchases	3
Other purchases	4

Source: Hayenga et al. (2000)

Packers were surveyed regarding the reasons they (and cattle producers) enter into forward contracts and marketing agreements. Moreover, survey respondents were asked to indicate via a 1 (not important) to 5 (very important) scale the importance of the reasons cited. The two most important reasons cited by packers to enter into forward contracts and marketing agreements with cattle producers were to “secure higher quality cattle,” and to “secure more consistent quality cattle” (Table 2). Interestingly, not only were these two factors the most important reasons in 1999, but packers also expect them to be of the same or greater importance in 2004. Improving risk management, reducing plant operating costs by improving slaughter plant capacity utilization rates, and assuring food safety were the next most important reasons (average scores of 2.8 to 3.0 in 1999). Packers expect all three to become more important, with food safety and plant operating efficiency receiving ratings of 3.7 and 3.5, respectively, in 2004. The low importance (average score of 1.8) attached to the assertion that contracts enabled packers to purchase cattle for a lower price may be because contracts and agreements do not enable packers to pay lower prices for cattle. Securing cattle quality and quantity needs are the primary factors motivating beef packer use of contracts and marketing agreements with cattle producers.⁶

Packers perceived producers’ primary incentives to enter into contracts and marketing agreements were to secure a quality premium/discount matrix followed by enabling producers to obtain a higher price for cattle (Table 3). Packers felt that in the next five years producers would benefit from marketing agreements primarily because of these same reasons and to enable producers to obtain detailed carcass quality data.

⁶ In an open-ended question, survey respondents indicated important forces leading to a reduction over time in the percentage of cattle being purchased in the cash market included: efficiencies gained by aligning producers and packers; increased needs for consistent supplies necessary for branded beef programs and operational efficiency; to better meet changing beef customer demands; and concerns over losing cattle to competitors.

Table 2. Packer Survey Responses of Importance of Contract and Marketing Agreement Incentives to Beef Packers.^a

Importance to Packers	1999 Average	2004 Expected Average
Reduce plant operating costs due to improved Slaughter plant capacity utilization	2.9	3.5
Secure higher quality cattle	4.0	4.2
Secure more consistent quality of cattle	4.0	4.2
Assure food safety	3.0	3.7
Improve long run price risk management	2.8	3.1
Improve week-to-week supply/price management	2.2	2.9
Reduce costs of searching for cattle to procure	2.3	2.4
Able to purchase cattle for lower price	1.8	1.8

^aScale of 1 to 5, 1=not important to 5=very important.

Source: Hayenga et al. (2000)

Table 3. Packer Survey Responses of Importance of Contract and Marketing Agreement Incentives to Cattle Producers.^a

Importance for Producers	1999 Average	2004 expected Average
Secure a buyer for cattle	2.6	2.8
Secure a quality premium/discount	4.0	4.0
Reduce price risk	3.3	3.3
Reduce costs of searching for a cattle buyer	2.4	2.8
Able to sell cattle for higher price	3.8	3.8
Easy to get loans	3.1	3.4
Provide detailed carcass data	3.4	3.6

^aScale of 1 to 5, 1=not important to 5=very important.

Source: Hayenga et al. (2000)

Use of fed cattle forward contracting and marketing agreements reduces costs for both beef packers and cattle producers. Beef packers strive to operate plants near designed capacity. However, fed cattle supplies and plant utilization rates vary considerably over time. Ward (1990) found that large (10,000 head or more weekly slaughter) steer and heifer slaughter plants had average weekly plant capacity utilization rates of 73 percent. Anderson and Trapp (1999) (using GIPSA data for the largest 15 beef packers) estimated average daily slaughter-capacity utilization rates of 85 percent for all operating days during April 5, 1992 to April 3, 1993.

Securing cattle well in advance of slaughter reduces the risk of not being able to acquire cattle needed to efficiently utilize plants and keep costs low. Because of their relatively high ratio of fixed to variable costs, packers have strong incentives to operate plants near capacity to minimize per unit costs (Koontz and Purcell 1997). Barkley and Schroeder (1996) determined that larger beef packers use contracts, marketing agreements, and packer feeding to help keep plant utilization high.

Packers realize significant cost savings when operating beef slaughter and processing plants near designed capacity. Anderson and Trapp (1999) estimated combined killing and fabrication costs for alternative slaughter rates for steers and heifers based on work by Duewer and Nelson

(1991). Increasing plant capacity utilization from 70 percent to 90 percent reduced plant killing and fabrication cost by an estimated \$16.20/head.

The cost changes came from operating below average capacity over time, and from fluctuations in supply around the average operating level. They concluded that added costs of up to \$5 per head (up to a range of \$150 to \$200 million per year) are incurred with the level of slaughter variation present in the industry. Such sizeable cost savings serve as a major motivation for beef packers to develop non-price means such as contracts and marketing agreements to better coordinate cattle flows into beef packing plants. Gottschalk, estimates that beef processing profits averaged \$5.23 per head during 1990-1999, so cost savings of that magnitude could have a significant short run impact on packer profitability. In the long run, part of these cost savings are passed on to cattle producers through higher prices paid for fed cattle, and to consumers as lower prices for beef.

Cattle Producer Motivations

Two separate research projects have focused on cattle feeders' motivations for using contracts and marketing agreements. Ward and Bliss (1989) conducted a survey of cattle producers which was similar to the Hayenga et al. survey of packers. They mailed a survey to 3,700 cattle feeders located in the 13 leading cattle feeding states during spring 1989 and received 503 useable responses. More recently, Schroeder et al. (1998) confirmed several of the Ward and Bliss findings and identified additional motivations for cattle feeders to enter into contractual arrangements with beef packers. In general, many of the same motivations for contracts and marketing agreements noted by packers were also identified by cattle feeders. Primary benefits derived by cattle feeders from the use of contracts and marketing agreements include improved price risk management, access to more financing options, guaranteed buyer for cattle, improved opportunity for carcass quality premiums, and reduced marketing costs (Table 4).

Table 4. Summary of Incentives for Cattle Producers to Enter into Contracts and Marketing Agreements with Beef Packers

Contract Type	Cattle Feeder/Feedlot Benefits
<u>Forward Contracts</u>	<ol style="list-style-type: none"> 1. Reduce price risk if cattle are hedged or flat priced 2. Obtain favorable financing 3. Ensure a buyer for cattle 4. Reduce marketing cost
<u>Marketing Agreements</u>	<ol style="list-style-type: none"> 1. Premiums for some cattle quality characteristics 2. Obtain carcass information 3. Ensure a buyer for cattle 4. Reduce marketing costs
<u>Packer-Owned Feeding</u>	<ol style="list-style-type: none"> 1. Increase feedlot utilization 2. Improve packer to feedlot relationship

Source: Summarized from Ward and Bliss (1989) and Schroeder et al. (1998).

One of the most important benefits of contracts and marketing agreements is their impact on risk. Marketing agreements and contracts between beef packers and cattle feeders can serve as a risk management tool. Some forward contracts that establish price reduce price risk for both cattle feeders and beef packers. Contracts enable cattle feeders to obtain more favorable financing terms (Ward and Bliss 1989). Having a buyer identified in advance assures cattle feeders of a timely market outlet. Feedlots have about a two-week period over which they can most effectively market fed cattle. During this time frame, with steady market prices and typical quality and yield grade discounts, profits tend not to change by more than \$1/head. However, selling cattle one-week prior to this period reduces profit by about \$6/head, and holding them one week past the optimal period reduces profit by about \$2/head (Anderson and Trapp 1999). Therefore, risk of lost profit for cattle feeders from not selling cattle at the optimum time is reduced if a buyer is lined up well in advance.

Cattle producers also realize reduced costs (in addition to those passed down by beef packers) through entering into contracts and marketing agreements with packers. One significant cost benefit of formula pricing is that it reduces costs associated with daily price discovery for feedlot managers (Schroeder et al. 1998). These costs include considerable time collecting, analyzing, and monitoring short-term fed cattle market conditions as well as on-going time spent negotiating prices with packers.

Industry Benefits

Marketing agreements and contracts can also contribute to overall efficiency in the beef marketing system. Reducing risks faced by cattle feeders and beef packers allows both parties to perform their economic activities of production and processing, respectively, at lower cost. Beef packers must operate near capacity to fully capture cost efficiencies of their large slaughter plants. When packers operate close to capacity, producers benefit from higher fed cattle prices and consumers benefit from lower beef prices, than would otherwise occur. Captive supplies better enable beef packers to anticipate and improve timing of cattle deliveries to operate slaughter plants near capacity. However, aside from Anderson and Trapp (1999), research to date has not estimated the size of beef packer efficiency gains associated with the use of captive supplies.

Some contracts and agreements are also a step toward value-based marketing of live cattle. Captive supply agreements that contain price adjustments for varying carcass quality attributes provide cattle feeders increased incentives to produce cattle possessing desired quality characteristics. Most marketing agreement and/or formula-priced cattle are priced based on carcass grade and yield or other quality. Fed cattle sold in the cash market are largely sold on a live or dressed basis. Jones *et al.* (1992) and others have determined that price differentials for cash cattle do not fully reflect wholesale meat value differentials associated with differences in carcass quality. This has been referred to in the industry as cattle being “bought on the average” with little difference in prices related to quality differences. Beef carcass value-based marketing ultimately contributes to improved meat product quality and consistency and may strengthen retail consumer beef demand, thereby helping beef compete more effectively with other meat products.

Traditionally fed cattle have been sold on a live weight basis. However, live cattle pricing has been inadequate at sending appropriate pricing signals to producers regarding cattle quality attributes (Schroeder et al. 1998). Much of the beef product quality problem has resulted from poor coordination of the vertical beef production and marketing system (Lamb and Beshear 1998; Schroeder and Mark 2000). Schroeder et al. (1998) concluded that a considerable amount of beef system coordination problems rest in poor information transmission between cattle feeders and beef packers. They argued that live-weight average pricing of fed cattle inhibits information flow from beef consumers to cattle producers. This poor information flow, resulting in poor beef quality, contributed to beef demand declining by nearly 50 percent from 1980 to 1998 (Purcell 1998; Schroeder, Marsh, and Mintert 2000).

Several analysts have argued that for the beef industry to revitalize consumer demand, it must improve information flow and increase value-based price discovery of fed cattle (Fausti, Feuz, and Wagner 1998; Lamb and Beshear 1998; Schroeder et al. 1998). Schroeder and Graff (2000) estimated that high-quality cattle subsidize low-quality cattle by an average of at least \$30/head when fed cattle are marketed using traditional live-weight or dressed-weight pricing methods compared to quality-based grid pricing. Therefore, there are sizeable incentives for both producers of better cattle and beef packers to move away from average live (or dressed) weight cattle pricing and move towards value-based grid (or grade and yield) pricing.

Value-based pricing of fed cattle leads to increased vertical alliances and contracts between beef producers and packers for several reasons. First, to enable beef packers to supply their customers with the specific qualities of beef products they demand, packers need to make certain they have access to cattle possessing the desired attributes. The way packers do this is by entering into marketing agreements with producers to supply the quality of beef in the volume the packer needs to meet specific customer demand. Second, Hennessy (1996) demonstrated that when it is difficult to discern quality differences of raw farm products, as is the case for live cattle (Jones et al. 1992), the processor has increased incentive to vertically integrate in some fashion with producers. Third, beef producers have begun to recognize the large average pricing errors (on average, more than \$30/head and a range in excess of \$150/head) present when they sell cattle on a live basis (Schroeder and Graff 2000), and the related incentives to sell high quality cattle using a value-based pricing system. Value-based pricing systems pay premiums and discounts for varying quality attributes (e.g., USDA quality and yield grades and carcass weight) of cattle. Ward and Lee (1999) collected cattle price premium and discount schedules for seven different packers. Packer premiums and discounts for various traits differed across packers. Thus, cattle producers who adjust cattle management and genetics have an incentive to enter into a long-term marketing agreement with the beef processor with the most advantageous value-based pricing system.

In summary, beef quality concerns together with more customers desiring specific beef quality attributes increased the need for beef packers to secure cattle possessing certain quality traits. At the same time, cattle producers realized there were sizeable economic incentives to price cattle based on individual carcass merit. Combined, these changes have created strong incentives for beef producers and packers to enter into various forms of alliances, partnerships, marketing agreements, and other contracts which benefit cattle producers, packers and, ultimately, consumers.

Have Captive Supplies Caused Fed Cattle Price Declines?

The concerns regarding marketing agreements and forward contracts are that they result in lower prices for producers. Several studies have found a negative correlation between captive supply deliveries and cash market fed cattle prices. One of the first studies to attempt to determine the relationship between captive supplies and cash fed cattle prices was a paper published in 1993 which was based on a data collected in 1990 (Schroeder et al. 1993). In that paper, it was *presumed* that captive supply deliveries *caused* fed cattle price changes, although we had no presumption on whether the correlation would be positive, negative, or zero. The state of our knowledge at that time made this a reasonable assumption. Our testing procedure allowed us to test whether a statistical relationship was present between captive supplies and fed cattle prices, but it did not allow us to test the direction of causality. Other studies conducted around the same time used similar assumptions and came to similar conclusions (e.g., Elam 1992).

Research is a cumulative learning process and as we continued to study this issue and gained a better understanding of how marketing agreements actually work, we questioned whether our presumed direction of causality was correct. Therefore, in more recent work (Ward, Koontz, and Schroeder 1998) a statistical test was used (a version of the Hausman test) to explicitly test whether our earlier causality assumption was correct. We concluded that it was not. In fact, fed cattle prices and captive supply deliveries were jointly (i.e., simultaneously) determined. In other words, causality was not unidirectional from captive supplies to fed cattle price as Schroeder et al. (1993) (and other studies) had presumed in earlier work.

Recent work by Schroeter and Azzam (1999) explains why expected fed cattle price might actually cause captive supply deliveries rather than the reverse. The essence of the argument is that feedyards make captive supply delivery decisions based upon fed cattle price expectations. For most marketing agreements, producers inform packers of their intent to deliver cattle under the agreement about two weeks in advance. Producers normally make the decision on which week to deliver marketing agreement cattle. Furthermore, producers also make the decision regarding which pens of cattle to deliver under the marketing agreement and which pens to sell on the cash market or via other means. Many marketing agreements have a base price which is determined (entirely or primarily) by the cash market price of fed cattle purchased in the week before the marketing agreement cattle are delivered.

Therefore, if producers expect fed cattle prices to increase in two weeks, they have the incentive to hold cattle for delivery under their marketing agreement until the third week (where they will get the benefit of the high cash market price in week two). Alternatively, they could sell their cattle in the cash market in week two (and get the benefit of higher cash prices in that week) rather than delivering the cattle under their marketing agreement in week two (where they would get a marketing agreement price based on the lower cash market price in week one). Either way, if the cash market price actually turns out to be high in week two, it will correspond to low marketing agreement deliveries in that week. A similar analysis can be made in the situation where the marketing agreement feedyard expects prices to trend lower, yielding an association of high marketing agreement deliveries in a given week and low cash market prices

in that week. Because cattle producers have access to considerable short run fed cattle market information and they can pay consultants to provide analysis of short-run market conditions, they would be expected to be able to forecast weekly fed cattle prices with some degree of accuracy over time. Thus, one plausible reason fed cattle prices are negatively correlated with captive supply deliveries is that the timing of marketing agreement deliveries is affected by expectations about the cash market price, and those expectations often match what actually happens.

Marketing Margins

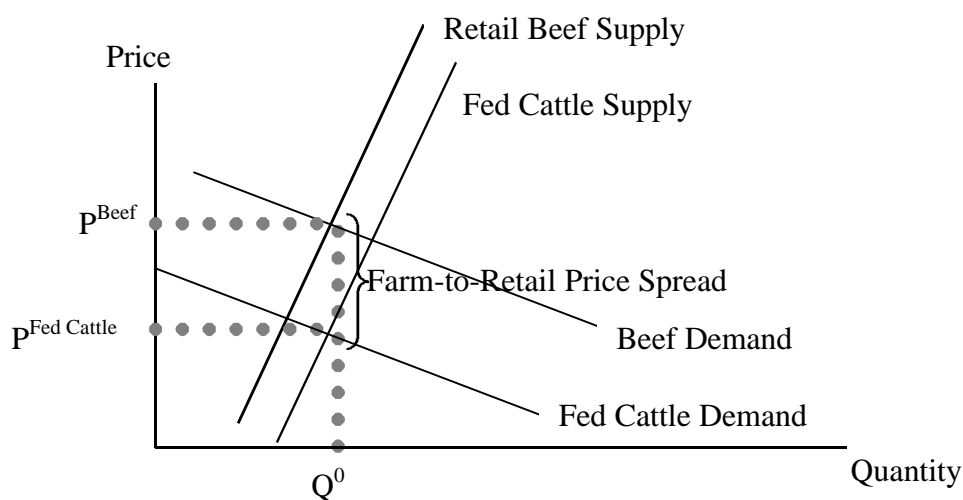
With beef packer concentration at a high level, concern has been expressed that beef packers use captive supply to manipulate the fed cattle market and increase their margins. Although no economic study has demonstrated this to be the case, it justifies a brief review of the linkages between retail, wholesale, and farm beef prices and associated marketing margins.

Retail beef price is determined by the intersection of retail beef demand and supply curves. Fed cattle price is determined by the intersection of the derived demand for fed cattle by packers (derived from consumer demand for beef) together with the supply curve of beef by cattle producers (Figure 4). The difference between retail beef price and farm level fed cattle price at a point in time reflects the costs of processing and marketing services as noted earlier and is referred to as the farm-to-retail price spread or margin (Figure 4). Therefore, fed cattle price changes when beef demand or supply changes or when the farm-to-retail margin changes.

For the given supply and demand curves, the market equilibrium retail price is P^{Beef} , the fed cattle price is $P^{\text{Fed Cattle}}$, and the quantity supplied and demanded is Q^0 . The farm-to-retail price spread (P^{Beef} minus $P^{\text{Fed Cattle}}$) reflects marketing costs and returns to capital in beef processing, wholesale, and retail sectors. Any shift in demand (as described earlier) will change price and *perhaps* quantity, depending upon the slope of the supply curve.⁷ Any change in supply (caused by factors noted earlier) will also change price. In between the fed cattle and retail beef supply and demand curves is the wholesale supply and demand curves (not shown in the picture). The wholesale supply and demand represent beef packer supply and demand. The farm-to-retail margin consists of the farm-to-wholesale plus the wholesale-to-retail margin. The farm-to-wholesale price spread measures the difference in price beef packers receive for beef at the wholesale level and the farm-level price of fed cattle. The wholesale-to-retail price spread measures the difference between the retail beef price paid by consumers and the wholesale price at which packers sell beef.

⁷ Quantity may or may not change as demand shifts depending upon the slope of the supply curve. In the short run, cattle supply is nearly vertical because production is predetermined as a result of biological lags in production discussed earlier and thus a change in demand changes only price. Over the longer run, a change in demand will also change quantity as the supply curve is not vertical.

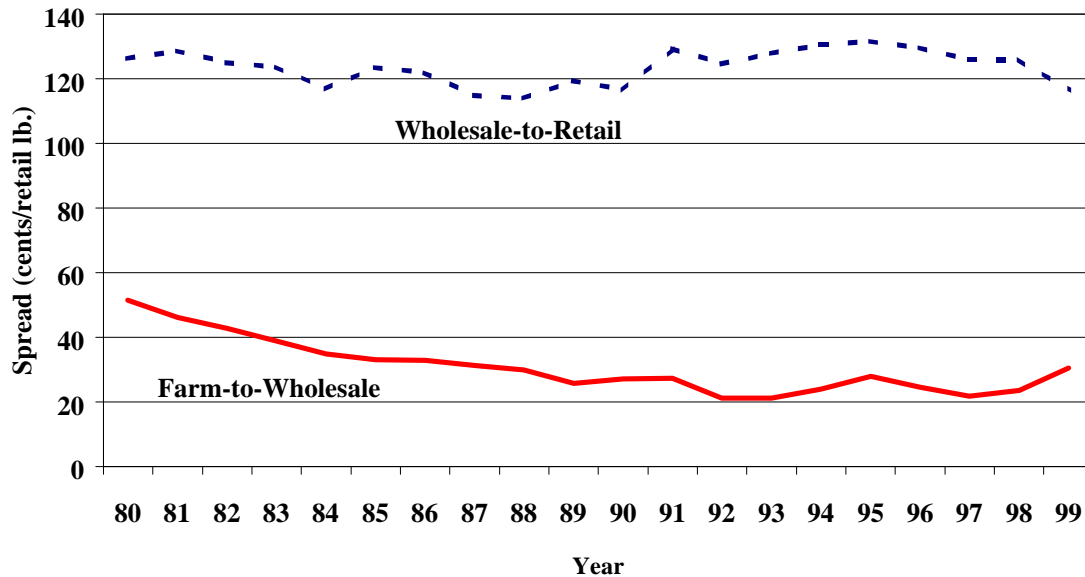
Figure 4. Farm-to-Retail Price Spread.



The price of fed cattle is determined over time by changes in fed cattle supply, changes in retail consumer and wholesale beef demand, and changes in the marketing margin between retail, wholesale, and farm levels of the marketing chain. Fed cattle and wholesale and retail beef prices change together over time as shown in Figure 3. The reason these three price series exhibit similar patterns is because changes in fed cattle supply and beef demand affect prices at these three different market levels in similar ways. Any change in retail demand for beef changes wholesale demand and farm demand and, with all else held constant, changes both retail beef and fed cattle prices. Likewise, changes in fed cattle supply are reflected by changes in wholesale and retail beef supply and directly influence fed cattle and wholesale and retail beef prices. The important point here is that the same market fundamentals are primary determinants of prices over time at retail, wholesale, and farm market levels and changes in fundamentals affect prices in these markets in similar ways. As a result, the price series are closely linked.

Inflation-adjusted farm-to-wholesale and wholesale-to-retail beef price margins over the 1980 to 1999 period are illustrated in Figure 5. Several important points are noteworthy. First, the inflation-adjusted wholesale-to-retail price spread has had no discernable trend over the last 20 years varying from a low of \$1.14/lb. in 1988 to a high of \$1.32/lb. in 1995. This indicates that after adjusting for inflation, the wholesale-to-retail price spread has remained relatively stable over time suggesting inflation-adjusted costs of merchandising meat by retailers has not changed appreciably over this time frame. The inflation-adjusted farm-to-wholesale margin shows a downward trend from 1980 through the early 1990s declining from \$0.51/lb. from 1980 to \$0.21/lb. in 1992. Since 1992, the inflation-adjusted farm-to-wholesale margin has fluctuated but shown no long-term change.

Figure 5. Inflation-Adjusted Wholesale-to-Retail and Farm-to-Wholesale Beef Price Spread, 1980-1999 (1999 Dollars)



Source: USDA & Commerce Dept.
Price Deflated by Consumer Price Index 1999=100

Although this analysis does not indicate what the farm-to-wholesale or wholesale-to-retail margins would be like if captive supplies did not exist or if beef packers were less concentrated, it does demonstrate beef packer margins have declined over time. Research addressing the impact of beef packer concentration on wholesale and farm beef prices (e.g., Azzam and Schroeter 1995), suggests beef packer concentration has resulted in greater cost savings from economies of scale being passed on to producers in the form of higher fed cattle price and retailers in the form of lower wholesale beef prices than any possible adverse impacts associated with the use of market power. Furthermore, the cost efficiency gains associated with improved packing plant capacity-utilization rates as a result of beef packer use of securing fed cattle supply through marketing agreements has helped keep farm-to-wholesale margins smaller than they would be without use of these cattle procurement methods (Anderson and Trapp 1999).

Conclusion and Implications

The beef industry has suffered a devastating 20-year decline in consumer demand. This demand decline was caused in large part by the industry failing to provide the type of products consumers wanted. The reason the industry failed to provide products being demanded was largely a result of poor vertical coordination in the beef production and marketing system. Signals of what consumers wanted were not clearly sent to producers in the form of price differentials. This was happening at the same time as, and likely contributed to, beef quality declining and becoming more variable. With demand in such a long run slide, it was difficult for cattle producers to be profitable. When each successive year is met with lower beef demand than the previous year, with all else constant, inflation-adjusted retail, wholesale, and farm beef prices decline. The only way prices could increase in such an environment was to reduce per capita production through reduced supplies and producer attrition.

Some beef producers realized that they could produce the kinds of products consumers desire but that they needed to be rewarded for doing so. Traditional fed cattle pricing methods did not provide adequate incentives. These producers recognized a need to change the poor vertical coordination present in the beef industry. As such marketing agreements and other forms of cattle marketing methods increased in popularity. Not everyone embraced the changing marketing environment. Some producers resist change and prefer negotiating prices for individual pens of fed cattle on a weekly basis and selling fed cattle on averages. Such producers are frustrated when the market moves away from institutions they are comfortable operating under. This aspect is not dissimilar to the transition from terminal livestock markets to direct fed cattle trade that occurred several decades ago.

However, producers and beef processors alike have noted numerous advantages to moving away from direct fed cattle live animal trade. The most noteworthy change is the movement toward increased vertical coordination between beef packers and cattle feeders. The beef industry desperately needs marketing institutions that will enable innovation to improve market coordination.

Marketing agreements and similar forms of marketing institutions have been arisen to improve beef market vertical information flows. Though some components of some agreements may not be ideal (e.g., base prices tied to plant average prices), the primary intent of the agreements, to increase price-quality signals to producers and increase beef quality and consistency, is beneficial. If the beef industry is legislatively limited in its ability to continue to develop such marketing methods, the industry will revert back to the poor coordination and waning demand it faced the past two decades.

References Cited

- Anderson, J.D. and J.N. Trapp. *Estimated Value of Non-Price Vertical Coordination in the Fed Cattle Market*. Research Bulletin 2-99, Research Institute on Livestock Pricing, Virginia Tech, February 1999.
- Azzam, A.M. and J.R. Schroeter. "The Tradeoff Between Oligopsony Power and Cost Efficiency in Horizontal Consolidation: An Example from Beef Packing." *American Journal of Agricultural Economics* 77(1995):825-836
- Barkley, A.P. and T.C. Schroeder. "Long-Run Impacts of Captive Supplies." In *Role of Captive Supplies in Beef Packing*, pp. 1-51. Pub. No. GIPSA-RR 96-3, USDA/Grain Inspection, Packers and Stockyards Administration, Washington DC, May 1996.
- Brester, G.W. and T.C. Schroeder. "The Impacts of Brand and Generic Advertising on Meat Demand." *American Journal of Agricultural Economics* 77(1995):969-979.
- Capps, O. Jr., and J.D. Schmitz. "A Recognition of Health and Nutrition Factors in Food Demand Analysis." *Western Journal of Agricultural Economics* 16(July 1991):21-35.
- Dahlgran, R.A. "Complete Flexibility Systems and Stationarity of U.S. Meat Demands." *Western Journal of Agricultural Economics* 12(2, 1987):152-63.
- Duewer, L.A. and K.E. Nelson. *Beefpacking and Processing Plants: Computer-Assisted Cost Analysis*. Commodity Economics Division, USDA/ERS. Staff Report No. AGES 9115, April 1991.
- Eales, J.S. and L.J. Unnevehr. "Simultaneity and Structural Change in U.S. Meat Demand." *American Journal of Agricultural Economics*. 75(May 1993): 259-68.
- Eales, J.S. and L.J. Unnevehr. "Demand for Beef and Chicken Products: Separability and Structural Change." *American Journal of Agricultural Economics* 70(August 1988): 521-32.
- Elam, E. "Cash Forward Contracting versus Hedging of Fed Cattle and the Impact of Cash Contracting on Cash Prices." *Journal of Agricultural and Resource Economics* 17(1992):205-17.
- Fausti, S.W., D.M. Feuz, J.J. Wagner. "Value Based Marketing for Fed Cattle: A Discussion of the Issues." *International Food and Agribusiness Management Review* 1(1998):73-90.
- Flake, O.L. and P.M. Patterson. "Health, Food Safety, and Meat Demand." Presented paper, American Agricultural Economics Association annual meetings, Nashville, TN. August 1999. Available at: <http://agecon.lib.umn.edu/aaea99/sp99f102.pdf>

- Gottschalk, A., as cited in Iowa Banker's Presentation by John Lawrence,
http://www.iowabeefcenter.org/Presentations/IABANKERS032100mc_files/v3_documents.htm
- Hayenga, M., T. Schroeder, J. Lawrence, D. Hayes, T. Vukina, C. Ward, and W. Purcell. *Meat Packer Vertical Integration and Contract Linkages in the Beef and Pork Industries: An Economic Perspective*. Report prepared for the American Meat Institute, May 22, 2000. Available at <http://www.meatami.org/whatlink.htm>
- Hennessy, D.A. "Information Asymmetry as a Reason for Food Industry Vertical Integration." *American Journal of Agricultural Economics* 78(November 1996):1034-43.
- Jones, R., T. Schroeder, J. Mintert, and F. Brazle. "The Impacts of Quality on Cash Fed Cattle Prices." *Southern Journal of Agricultural Economics* 24(1992):149-162.
- Kinnucan, H.W., H. Xiao, C.-J. Hsia, and J.D. Jackson. "Effects of Health Information and Generic Advertising on U.S. Meat Demand." *American Journal of Agricultural Economics* 79(1997):13-23.
- Koontz, S.R. and W.D. Purcell. "Price Discovery and the Future of the Livestock Sector." In *Price Discovery in Concentrated Livestock Markets: Issues, Answers, Futures Directions*, ed. W.D. Purcell, pp. 1-17. Research Institute on Livestock Pricing, Virginia Tech, 1997.
- Lamb, R.L. and M. Beshear. "From the Plains to the Plate: Can the Beef Industry Regain Market Share?" Federal Reserve Bank of Kansas City, *Econ. Rev.*, Third Quarter 1998, 18 pp., <http://www.kc.frb.org/publicat/econrev/ermain.htm>
- Purcell, W.D. "A Primer on Beef Demand." Research Institute on Livestock Pricing, Virginia Tech University, Blacksburg, VA, Research Bulletin, April 1998a.
- Purcell, W.D. "Measures of Changes in Demand for Beef, Pork, and Chicken, 1975-1998." Research Institute on Livestock Pricing, Virginia Tech University, Blacksburg, VA, Research Bulletin, October 1998b.
- Schroeder, T.C. and J.L. Graff. "Estimated Value of Increased Pricing Accuracy for Fed Cattle." *Review of Agricultural Economics* 22(2000):89-102 – In Press.
- Schroeder, T.C. and D.R. Mark. "How Can the Beef Industry Recapture Lost Consumer Demand?" *Journal of Animal Science* (In press 2000).
- Schroeder, T.C., T.L. Marsh, and J. Mintert. *Beef Demand Determinants*. Report prepared for the Beef Board Joint Evaluation Advisory Committee, January 2000.
- Schroeder, T.C., R. Jones, J. Mintert, and A.P. Barkley. "The Impact of Forward Contracting on Fed Cattle Transaction Prices." *Review of Agricultural Economics* 15(1993):325-337.

- Schroeder, T.C., C.E. Ward, J. Mintert, and D.S. Peel. *Beef Industry Price Discovery: A Look Ahead*. Research Bulletin 1-98, Research Institute on Livestock Pricing, Virginia Tech, Blacksburg, VA. March 1998.
- Schroeter, J.R. and A. Azzam. *Econometric Analysis of Fed Cattle Procurement in the Texas Panhandle*. USDA, Grain Inspection, Packers and Stockyards Administration. November 1999. Available at <http://www.usda.gov/gipsa>.
- Tomek, W.G. and K.L. Robinson. *Agricultural Product Prices, Third Edition*. Cornell University Press: Ithaca, NY. 1990.
- Ward, C.E. "Meatpacking Plant Capacity and Utilization: Implications for Competition and Pricing." *Agribusiness* 6(1990):65-73.
- Ward, C.E. and T.J. Bliss. *Forward Contracting of Fed Cattle: Extent, Benefits, Impacts, Solutions*. Research Bulletin 4-89, Research Institute on Livestock Pricing, Virginia Tech, November 1989.
- Ward, C.E., S.R. Koontz, and T.C. Schroeder. "Impacts from Captive Supplies on Fed Cattle Transaction Prices." *Journal of Agricultural and Resource Economics* 23 (December 1998):494-514.
- Ward, C.E. and J.I. Lee. "Short-Term Variability in Grid Prices for Fed Cattle." In *Formula Pricing and Grid Pricing Fed Cattle: Implications for Price Discovery and Variability*, pp. 39-55. Research Bulletin 1-99, Research Institute on Livestock Pricing, Virginia Tech., January 1999.